Better Buildings Alliance

Energy Management Information Systems (EMIS) for Retail, Food Service, and Grocery

December 9, 2014
2:00PM - 3:00PM EST
Call in: 1-866-952-8437
Access Code: 271-419-165

The Better Buildings Alliance

SECTOR TEAMS

COMMERCIAL REAL ESTATE & HOSPITALITY

HEALTHCARE

HIGHER EDUCATION

RETAIL, FOOD SERVICE & GROCERY

- The Better Buildings Alliance represents nearly 200 member organizations and approximately 10 billion commercial square feet across key market sectors.
- Members agree to: participate in at least one Alliance activity each year and share their successes with their peers.
- DOE commits to: connect members with technical resources and provide a platform for peer exchange.

Better Buildings members can join a team to help them meet their energy savings goals

Refrigeration

Laboratories

Energy Management Information Systems

Renewables Integration

Lighting & Electrical

Space Conditioning

Plug & Process Loads

Food Service

Financing

Leasing & Split Incentive

Data Access

Workforce Development

Agenda

- Introduction to the EMIS Technology Team
- Success Stories from the Retail, Food Service, and Grocery Sector
  - Managing Peak Demand with Building Automation Systems (BAS)
  - Integrating Information and Automation Systems
- Q&A

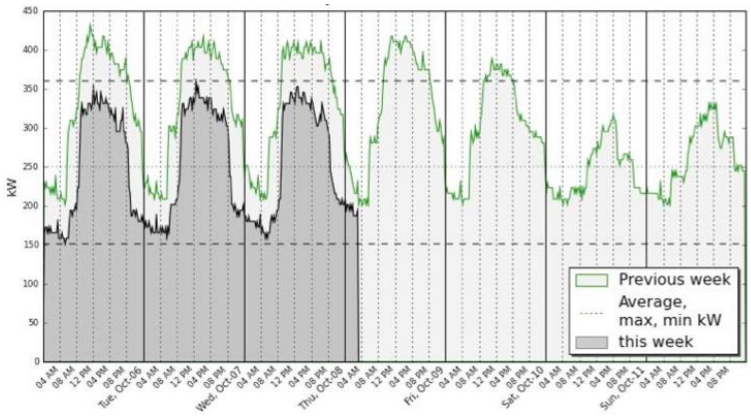
EMIS Technology Team Overview

- An introduction to EMIS technology team
- Resources highlights
- Areas of focus for the coming year

Motivation for EMIS work

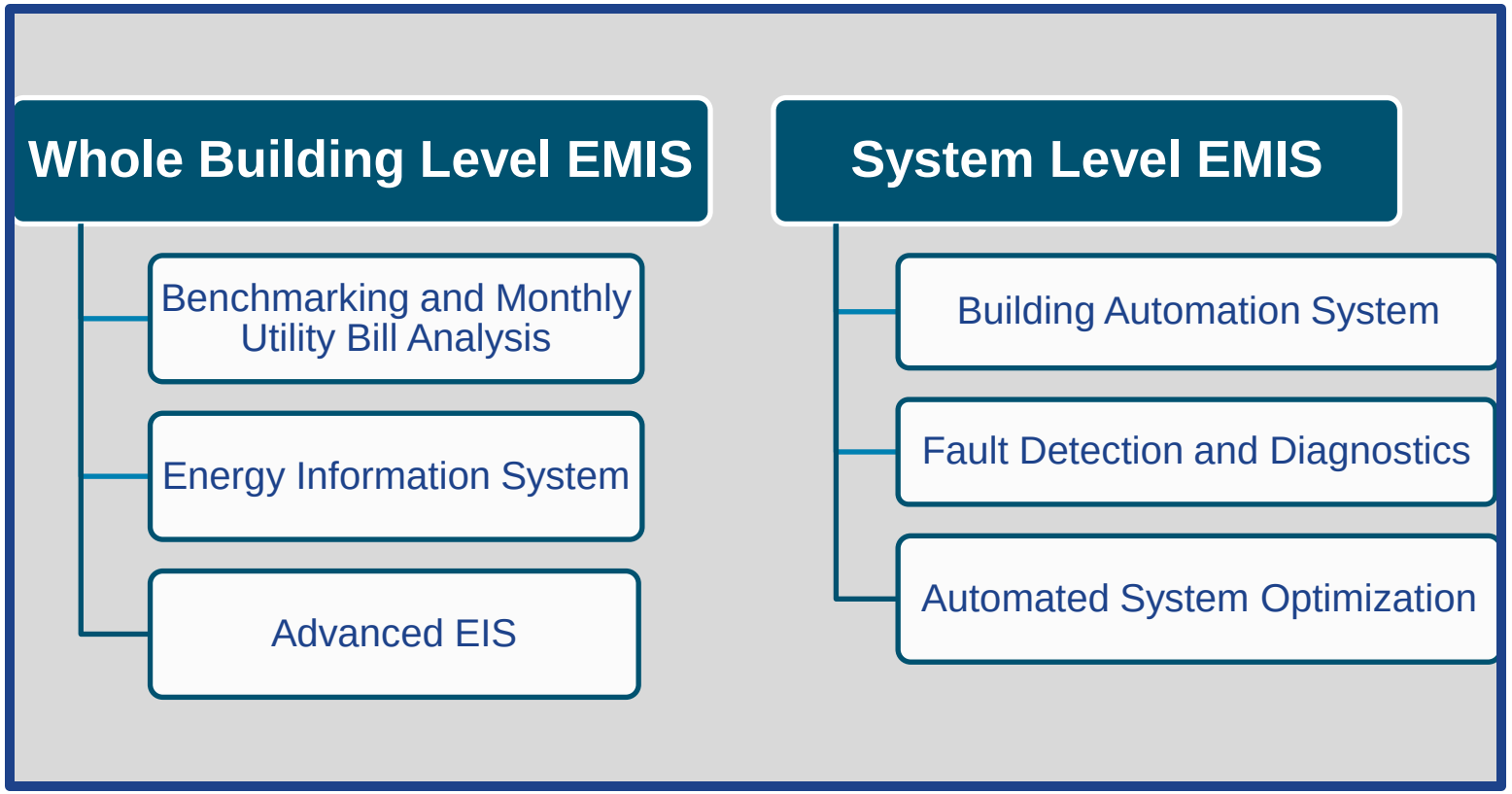
- Optimal performance requires higher granularity data, more timely analysis than monthly utility bills

- Energy Management and Information Systems (EMIS), broad family of tools that store, analyze, and display energy use or building systems data, enable up to 20% savings in operational efficiency



What are EMIS?

Energy Management and Information Systems (EMIS)

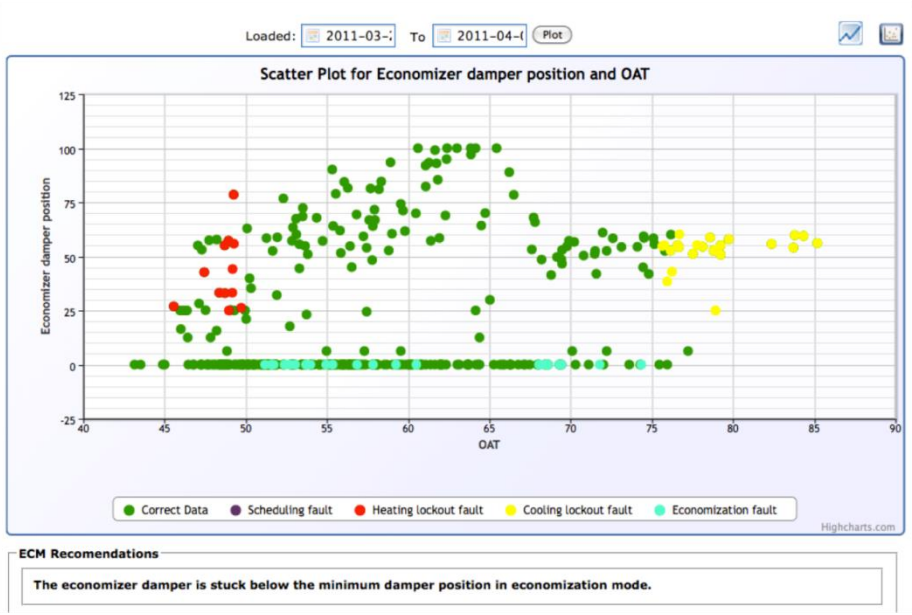


Benchmarking and Monthly Utility Bill Analysis

Energy Information System (EIS)

Building automation system (BAS)

Fault Detection and Diagnosis Tool

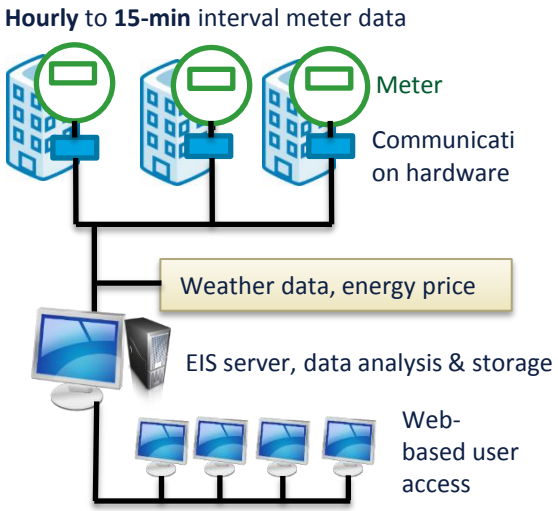


Source: Facility Dude (top left), Lucid Design Group (top right), Automated Logic (bottom left), Serious Energy (bottom right)

Resources Highlight
1. EMIS Technology Classification Framework

Technology attributes	Tools with a Whole-building Energy Focus			Tools with a System-level Focus		
	Benchmarking and Monthly Utility Bill Analysis	**Energy Information Systems**	**Advanced Energy Information Systems**	**Building Automation Systems**	**Fault Detection and Diagnostic Systems**	**Automated System Optimization**
Typical Data Scope	Whole-building	Whole building May include: submetering	Whole building May include: submetering and system-level monitoring	Systems, components, May include: system submetering	Systems, components, BAS trends May include: whole-building or system-level metering	
Typical Data Interval	Monthly	Hourly to 15-minute		15-minute and less		
Frequency of use	Monthly, annually	Daily, weekly, monthly			Weekly, monthly	
Primary Applications, Principal design intent	Utility bill reconciliation, energy use and cost tracking; peer-to-peer building comparisons of energy use.	Whole-building or portfolio energy tracking, and *data visualization* to identify opportunities to improve building operational efficiency.	Whole-building or portfolio energy tracking, and *automated interval data analysis* to identify opportunities to improve building operational efficiency.	Control of indoor temperature, light, and humidity setpoints based on building schedule; alarming of out-of-range operations.	Automated identification of faults, sometimes with associated causes, usually HVAC focused.	Automated modification of control parameters to optimize efficiency, energy use, and/or energy costs.

Resources Highlight – 2. EIS Technology Costs and Benefits



- Synthesis of targeted case investigations
  - 26 participating organizations, 260M sf install base, 17 unique EIS
- Median building savings of 17% ($56k) and portfolio savings of 8% ($1.3M)
  - Would not be possible without use of the EIS
  - Median 5% savings in the cases with low extent of energy efficiency projects
- Key benefits
  - Operational efficiency, utility validation and payment, data for other analyses
- Median 5-yr cost of software ownership:
  - $150K, 1800$/pt, .06$/sf over 5 year horizon

Resources Highlight – 3. EMIS Crash Course

- **Selecting a EMIS Tool**

Set organizational goals

Establish roles & responsibilities

Understand organizational conditions

Define activities to meet goals

Identify required sensing, metering

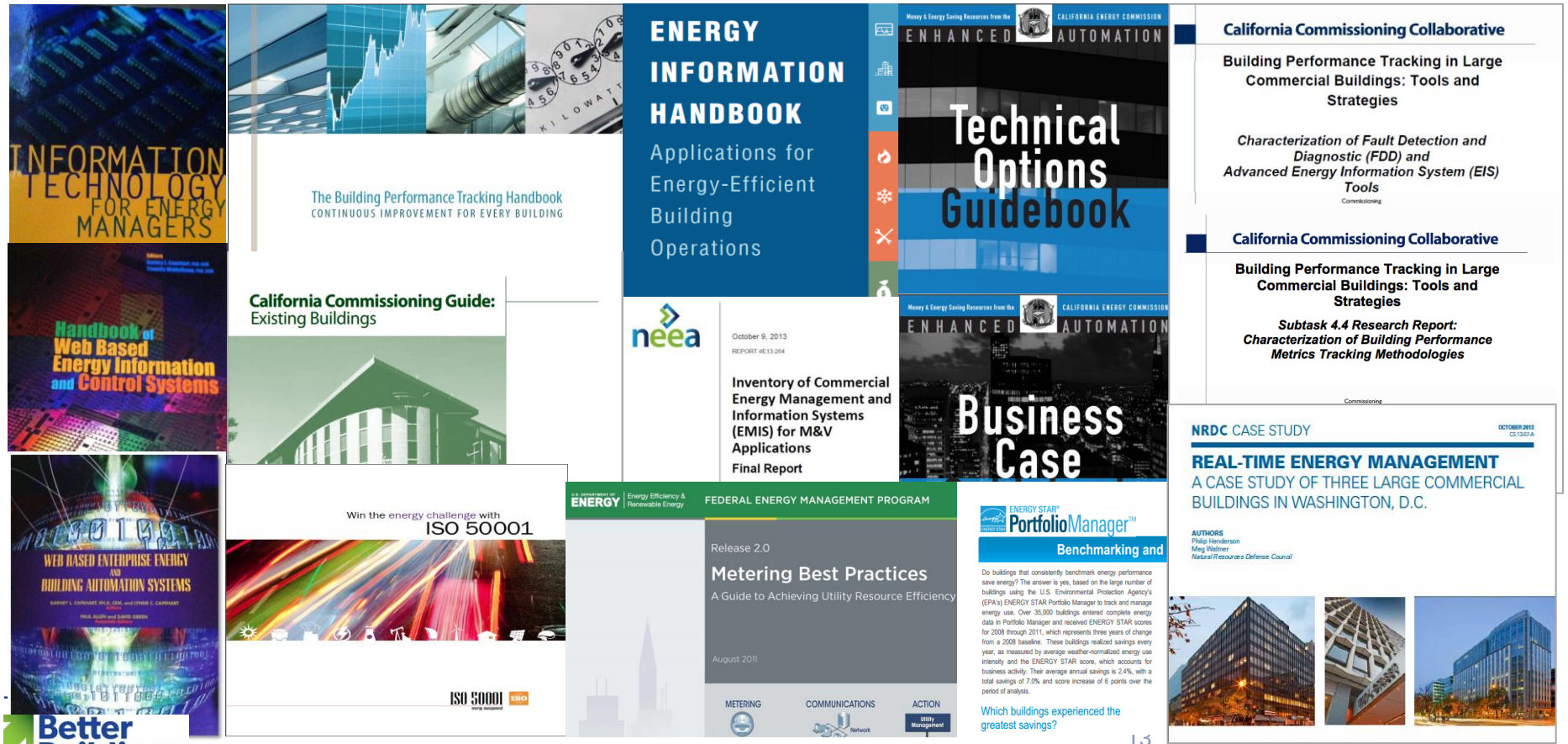
Select a tool(s)

- **Summary of EMIS Tools**

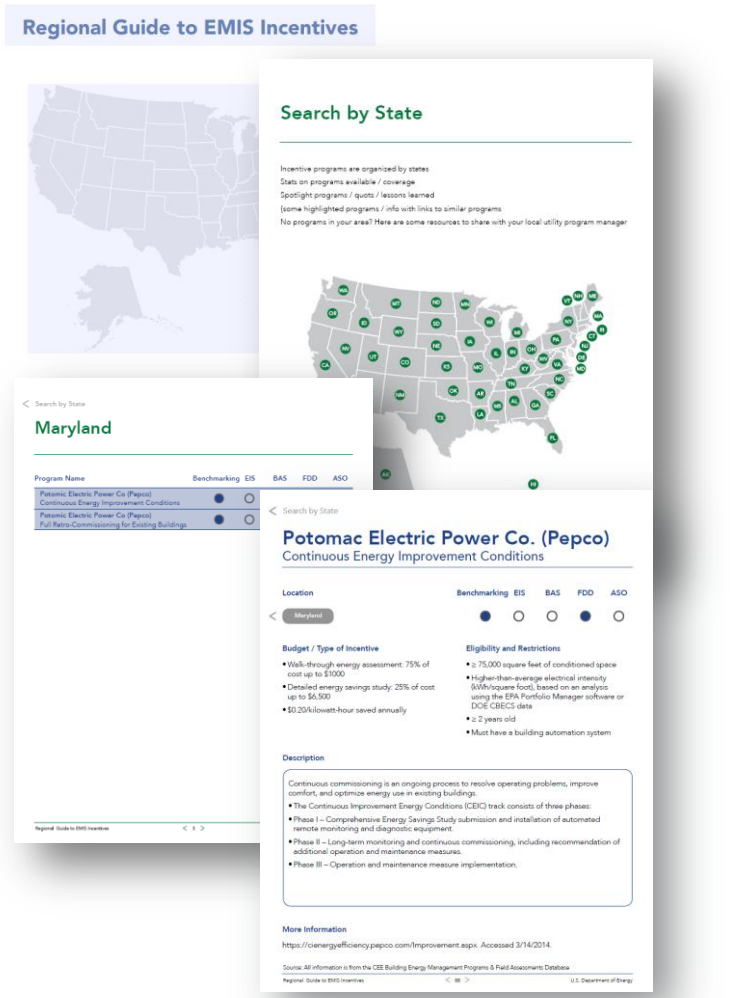
EMIS tools	Data scope	Key uses	Costs	Energy Savings
Benchmarking& utility bill analysis	Monthly utility bills	▪ Peer-to peer comparison ▪ Utility bill analysis	Free -$	2.4% (median) (whole building, enabled savings)
EIS & Advanced EIS	Hourly or 15-min meter data	▪ Energy dashboard/kiosk ▪ Benchmarking ▪ Energy anomalies alert ▪ Demand response ▪ Auto M&V	$$-$$$	8% (median), 0-33% (range) (whole building, enabled savings)
BAS	15-min or less interval sub-system data	▪ Building system control ▪ Manually troubleshooting by investigating trends	$$$$	10-15% (whole building)
FDD		▪ Auto system or component fault notification ▪ Fault causes identification	$$$	2-11%(whole building, potential savings)
ASO		▪ Optimal HVAC settings prediction	$$$	-

Resources Highlight – 4. Synthesis of EMIS Resources

- 'Cliff's Notes' Synthesis of ~40 existing guides, handbooks, case studies, specifications



Resources Highlight – 5. Regional Guide to EMIS Incentives



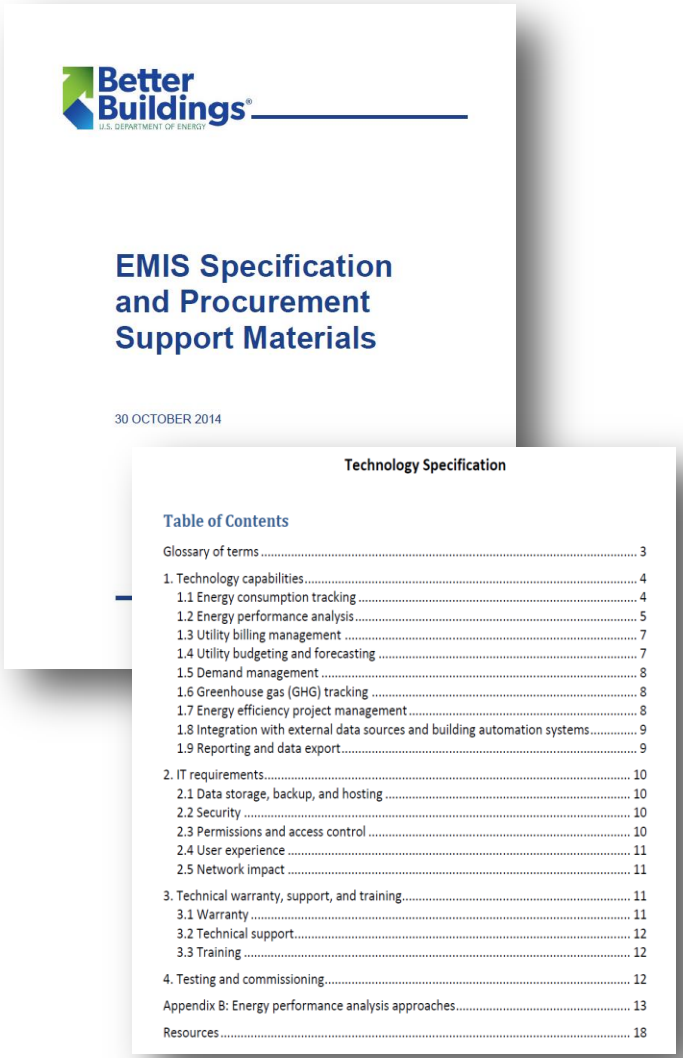
- Includes 50+ incentive and financing programs
- Programs cover the US
- Primarily utility programs, some state/local, other
- Hyperlinked PDF for easy navigation on your PC

Resources Highlight – 6. EMIS Product Overviews, Guest Access

- Webinar demonstrations and guest logins from vendors identified as high interest by project team members
  - Enerliance, LOBOS
  - Cascade Energy, SENSEI
  - Automated Logic, WebCTRL
  - EnergyCAP
  - NOESIS
  - Johnson Control, Panoptix

Graphic Source: Enerliance LOBOS(left), Cascade Energy SENSEI (right)

Resources Highlight – 7. EMIS Procurement Support Materials



- **Request for Proposal**
  - A template to create a project-specific RFP for vendors
- **Technology Specification**
  - A template of technology features that can be specified according to org. specific needs
- **Evaluation Criteria**
  - Several criteria to help choose between multiple competing proposals that satisfy the spec.

Areas of Focus for FY15

- **Peer learning, guest presentations**
  - Implementation and scale-up overviews from members, GSA Green Proving Ground, & CBI HIT demonstrations
  - EMIS to streamline and automate M&V
  - Evaluation of public sector utility pilot
  - DOE-India work in sector-specific packaged EIS solutions
- Ongoing **vendor overviews** and **guest login** access to EMIS offerings of interest to team members
- Presentation and member **adoption of procurement support materials** from this year
- Primer on **holistic organizational use of EMIS**: multi-year planning, roll-out, implementation, integration vertically and horizontally

Success Stories from the Retail, Food Service, and Grocery Sector

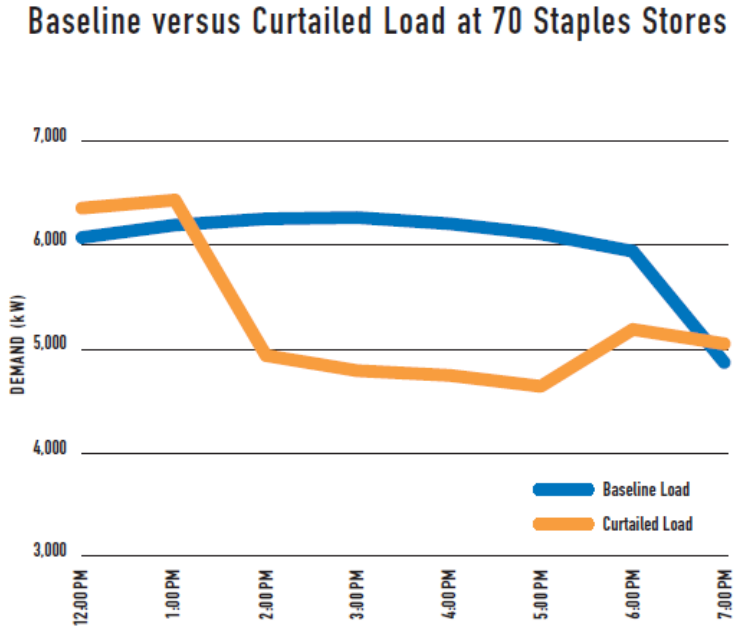
Success Stories: Managing Peak Demand with Building Automation Systems (BAS)

- Partnerships between utility companies and facility management for near instantaneous peak demand reduction

Success Stories: Staples

- **Enhanced automation system allows Staples to shed 2.8 MW demand from anywhere**

Building Type	Retail, multi-site
Site Size	119 stores
Cost	$320,000
Incentives	$300,000

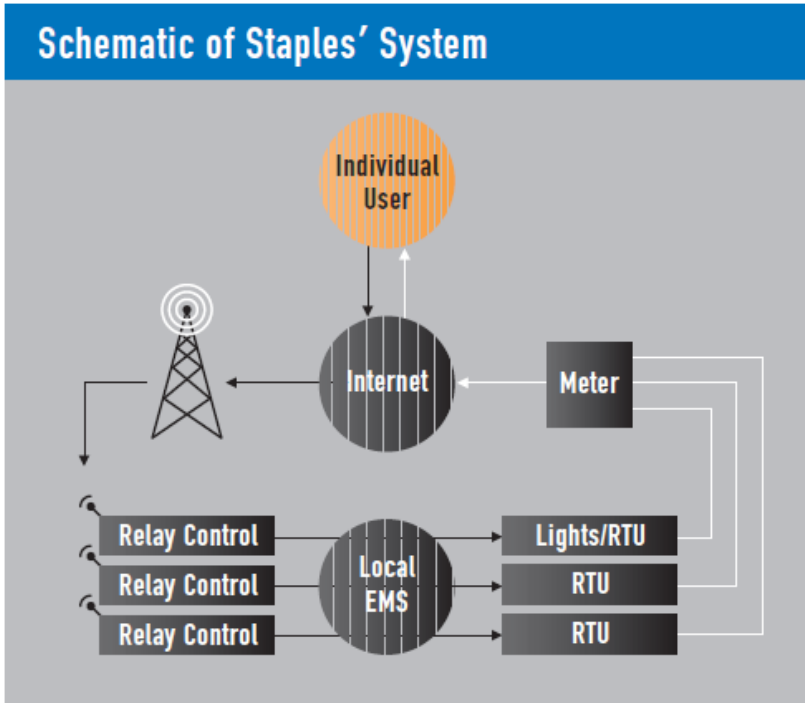


Highlights:

- For Staples: Ability to avoid high peak demand charges; sub-hourly energy data access and archiving
- For Utility: Increased grid reliability, avoided capacity increase

Success Stories: Staples, Technical Details

- **Previous System**
  - EMS with direct digital control for lighting and HVAC systems
- **Upgrades to System**
  - Paging activated relay system
  - Web-enabled software
  - Web server
  - Utility-Grade interval meters
- **Curtailment Levels**
  1) Half of store lighting and 1 Roof Top Unit (RTU)
  2) Level 1 + 1 Additional RTU
  3) Level 1 + 2 Additional RTUs

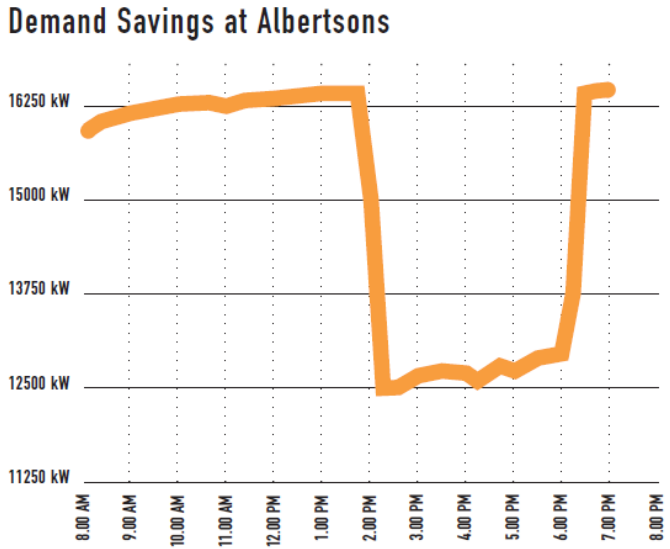


Load curtailment for all 119 stores in California is online within a half hour of when the signal for initiation is sent from HQ in Boston

Success Stories: Albertsons Grocery

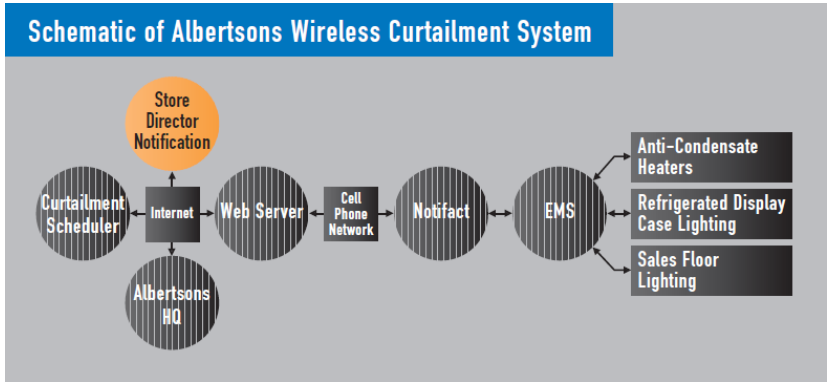
- **Albertsons can shed 7.5 MW of peak demand through lighting, Anti-Sweat Heater (ASH) Controls and EIS**

Building Type	Grocery, multi-site
Site Size	300 stores
Cost	$3.8 Million
Incentives	$1.8 Million
Payback Period	Immediate



Highlights:

- Albertsons and Energy Service Company (ESCO) share Demand Response (DR) program revenue
- Additional Benefits: Energy Savings Measurement and Verification (M&V)



Success Stories: Integrating Information and Automation Systems

- More and more companies are offering integrated EMIS solutions, and facility managers are taking notice

Success Stories: Designer Shoe Warehouse (DSW)

- **Company-Wide EMIS System is anticipated to be cost effective in less than 2 years**

Building Type	Retail, multi-site
Site Size	311 stores (company wide)
Incentives	None
Payback Period	2 years

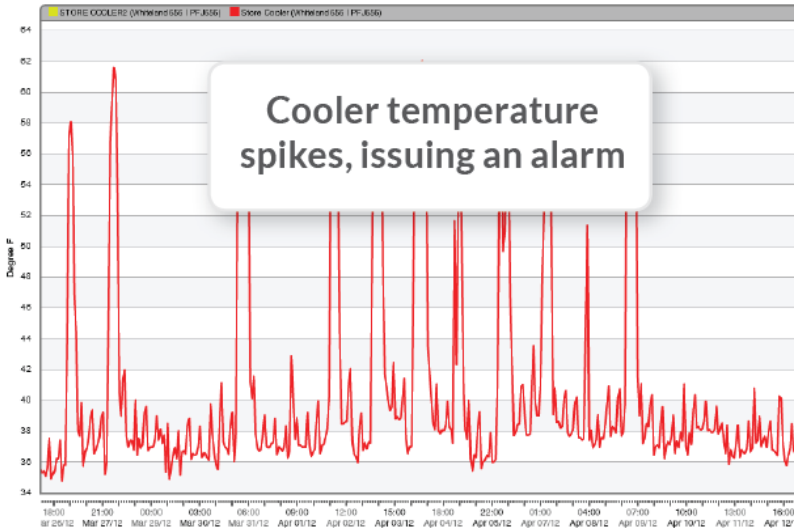
Highlights:

- Customized dashboards allow for remote monitoring of energy consumption, as well as monitoring and control of lighting and HVAC Key Performance Indicators
- Automated exception reports alert key stakeholders of poorly performing stores
- Primary Uses: M&V, Fault Detection & Prevention, Remote BAS Control

Success Stories: Wendy's

- **Immediately cost effective 12% energy savings for Wendy's Florida restaurants**

Building Type	Foodservice, multi-site
Site Size	12 stores
Cost	3,300/month for 3 years
Payback Period	2 years (w/o leasing) 0 years (with leasing)



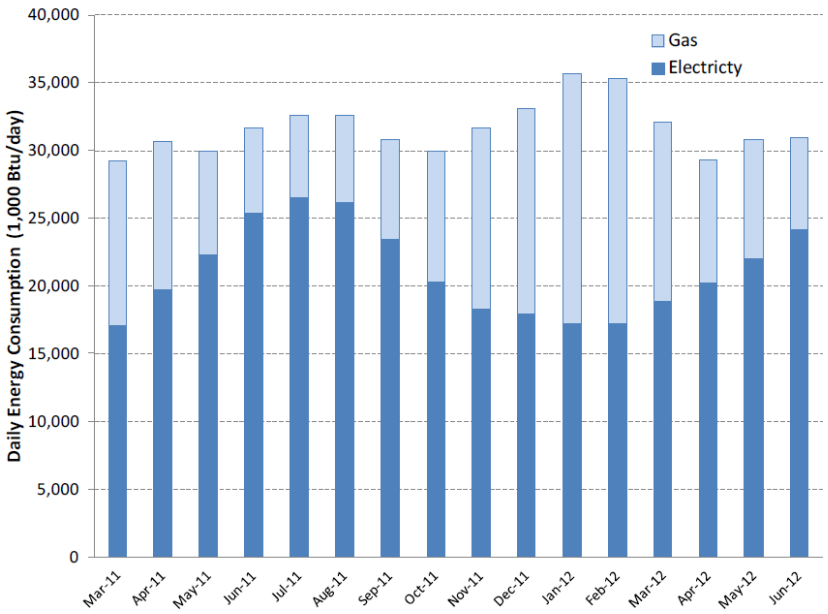
Highlights:

- Inefficient cooler door operation identified with EMIS
- Primary Uses: Energy Savings through lighting control, HVAC and Refrigeration control; Opportunity Identification, M&V, Preventative Maintenance

Success Stories: Whole Foods

- **Energy Information Systems (EIS) and modeling help to investigate savings in new building prototype**

Building Type	Grocery, Single Site
Site Size	40,000 ft^2
Payback Period	Less than 5 years



Highlights:

- Energy Savings: 32% better than ASHRAE -2004 Baseline
- The majority of this savings was achieved through upgrades to refrigeration equipment and interior lighting, such as LED lighting in refrigerated display cases
- Sub-metering & energy modeling revealed an additional 6% energy savings through improvements to defrost, ASHs, and condenser fans

Success Stories: Walmart

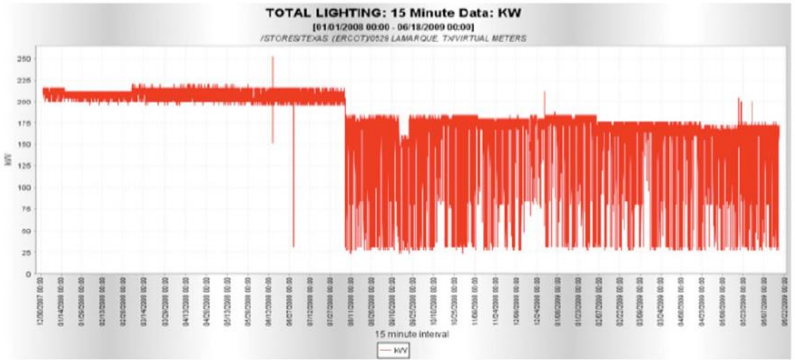
- **EIS is leveraged by Walmart to save between $20 and $40 Million on utility bills each year**

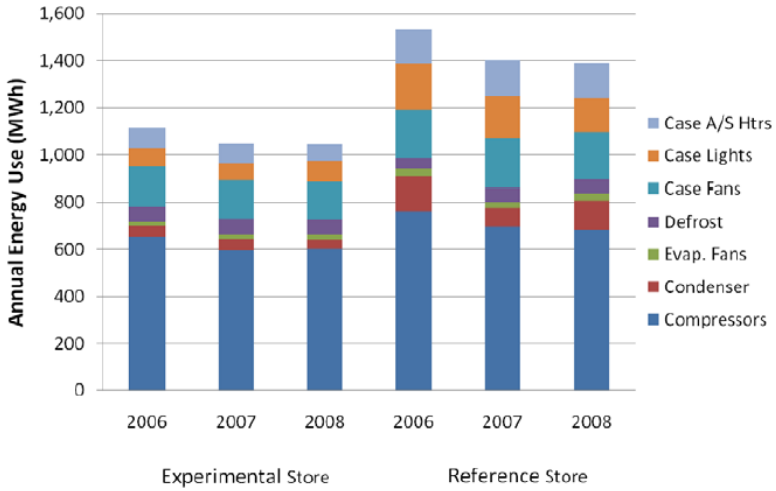
Building Type	Combined Retail & Grocery
Site Size	67 Million ft^2 (All US stores)

Highlights:

- Each month, a benchmarking analyst identifies the 20 poorest performing sites
- Regression-based predictions provided by the EIS software allow for week ahead energy and demand predictions that are accurate to within 1% for hourly data.
- In addition to benchmarking regular stores, data is used to benchmark experimental store energy consumption

At one site, poor store performance was traced back to a failed dimming control module



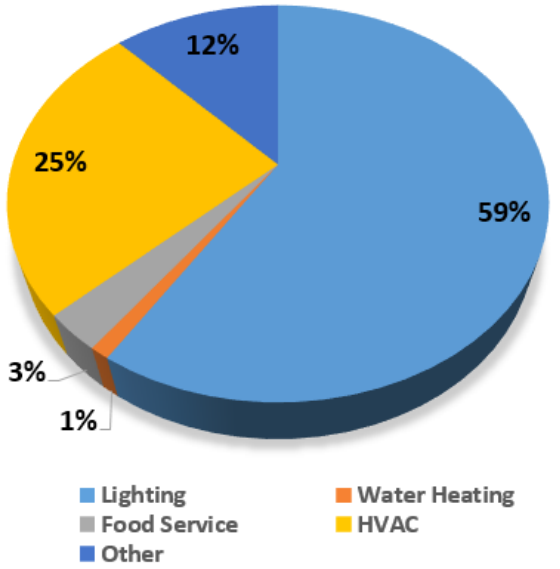


Success Stories: Michaels Craft Store

- **Michaels EMIS system brings "Intensive care unit" monitoring philosophy to buildings**

Building Type	Retail, multi-site
Site Size	1000+ stores

Breakdown of Michaels average annual energy consumption



Highlights:

- The EMIS system reports prioritized issues to higher-ups in Michaels every 4 hours
- CO^2 sensors monitor building occupancy, and the EMIS system adjust lighting and HVAC control accordingly
- The EMIS system also allows for integrated demand management with automated adjustments for real-time pricing fluctuations
- Michaels has already recorded 25% energy savings
- Primary Uses: M&V, Fault Detection & Prevention, Remote BAS Control

Success Stories: Case Study Resources

- Albertsons Grocery
  - *Albertsons Can Shed 7.5 MW of Peak Demand Through Enhanced Lighting Controls*
    - http://www.energy.ca.gov/2005publications/CEC-400-2005-059/CEC-400-2005-059-FS.PDF
- BestBuy
  - *Showcase Project: Skylights & Dimmable Fluorescent Lighting with Enterprise Energy Management System*
    - http://www4.eere.energy.gov/challenge/showcase/lasvegas/best-buy
- DSW
  - *Money-Saving Lessons in Energy Management*
    - http://www.us.sbt.siemens.com/marketplaces/rcs_docs_camp/whitepapers/DSWRetailerArticle.pdf
- IKEA
  - *PG&E and IKEA – Assembling Cost-Effective Energy Management*
    - http://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/incentivesbyindustry/cs_ikea.pdf
- Michaels Craft Store
  - *RCS Starving the Energy Monster*
    - Shortened URL for Siemens Case Study, Michael's Craft Store
- Safeway
  - *PG&E and Safeway – An Alliance in Energy Conservation*
    - http://www.pge.com/includes/docs/pdfs/mybusiness/energysavingsrebates/incentivesbyindustry/retail/ctm-0609-0016_safeway.pdf

Success Stories: Case Study Resources

- Staples
  - *Enhanced Automation Allows Staples to Shed 2.8 MW Across 119 Stores from a Single Location*

- Walmart
  - *Building Energy Information Systems: User Case Studies*
    - http://eis.lbl.gov/pubs/beis-case-studies.pdf
  - *Wal-Mart Experimental Store Performance Stories*
    - http://www.nrel.gov/buildings/pdfs/48295.pdf
- Wendy's
  - *Wendy's Chain Realizes Significant Cost Savings*
    - http://www.gridpoint.com/case-study-wendys-restaurant-fast-food-franchise
- Whole Foods
  - *Whole Building Efficiency for Whole Foods*
    - http://www.nrel.gov/docs/fy13osti/56331.pdf
  - *Whole Foods Market Improves Energy Efficiency in New Construction*
    - http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/whole_foods_improves_energy_efficiency.pdf

Discussion

Discussion

- Discussion of EMIS applications in the sector
  - What type of EMIS are in use or being considered for use in your organization?
  - What are the key uses or activities in the last year?
  - What motivated your EMIS implementation?
  - What have been key lessons learned in your use of EMIS?
  - What are critical challenges you are facing in deploying EMIS?
  - How can we deliver value as a project team? What new knowledge is needed?
- Q &A with EMIS project team leads

Ready to join the EMIS team?

- If you already a member of the Better Buildings Alliance, email Guanjing Lin (gjlin@lbl.gov) or Samuel Fernandes (sgfernandes@lbl.gov) to join the EMIS team.

- If you are not yet a member of the Better Buildings Alliance, we hope that you will join us. Complete the sign up form at eere.energy.gov/betterbuildingsalliance/join

Thank You

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